January 12, 1837.

CAPTAIN SMYTH, R.N., Vice-President, in the Chair.

"An attempt to account for the discrepancy between the actual Velocity of Sound in Air or Vapour, and that resulting from theory." By the Rev. William Ritchie, LL.D., F.R.S. Professor of Natural Philosophy at the Royal Institution, and in University College, London.

Sir Isaac Newton determined from theory that the velocity of the undulations of an elastic medium generally is equal to that which a heavy body acquires in falling by the action of gravity through half the height of a homogeneous atmosphere of that medium; but the actual velocity of sound in atmospheric air is found to be one eighth greater than what is assigned by that formula. This difference was attempted to be accounted for by Newton on the supposition that the molecules of air are solid spheres, and that sound is transmitted through them *instanter*. Laplace endeavoured to reconcile the difference between theory and observation, by the hypothesis that heat is disengaged from each successive portion of air during the progress of the condensed wave. The author of the present paper regards the hypothesis of Laplace as a gratuitous and improbable assumption; the falsehood of which he thinks is apparent from the fact that a rarefied wave advances through air with the same velocity as a condensed wave, which would not be the case if in either instance their progress were influenced by the heat evolved. He then enters into calculations to show that if the molecules of water be assumed as incompressible, and, when at the temperature of maximum density, very nearly in absolute contact, we ought, in estimating the velocity of sound in steam, to add to the velocity given by the formula of Newton, the rectilinear space occupied by the molecules; which, if a cubic inch of water be converted into a cubic foot of steam, will be one twelfth of the distance. By comparative experiments with a tuning-fork held over a tube, closed at one end, and containing at one time air, and at another steam, and also by similar trials with organ pipes of variable lengths, the author found a close agreement between his theory and observation. He also shows that this theory furnishes the means of determining, *à priori*, the density of a liquid, if the velocity of sound in the vapour of that liquid be given. In a postscript he adduces further confirmation of the truth of his theory by observations on the velocity of sound in hydrogen gas, and in carbonic acid gas.

January 19, 1837.

FRANCIS BAILY, Esq., V.P. and Treasurer, in the Chair.

Benjamin Bond Cabbell, Esq., Charles Holland, M.D., John Urpath Rastrick, Esq., and Samuel Solly, Esq., were elected Fellows.

"Researches towards establishing a Theory of the Dispersion of Light." By the Rev. Baden Powell, M.A., F.R.S., Savilian Professor of Geometry in the University of Oxford.

The author here prosecutes the inquiry on the dispersion of light which was the subject of his former papers published in the Philosophical Transactions for 1835 and 1836, extending it to media of higher dispersive powers, which afford a severer test of the accuracy of M. Cauchy's theory. He explains his methods of calculation and the formulæ on which his computations are founded, and which are different from those employed in his former investigations: and then states the results in a tabular form. On the whole he concludes that the formula, as already deduced from the undulatory theory, applies sufficiently well to the case of media whose dispersion is as high as that of oil of anise-seed: or below it, such as nitric, muriatic, and sulphuric acids, and the essential oils of angelica, cinnamon, and sassafras, balsam of Peru, and kreosote. It also represents, with a certain general approximation to the truth, the indices of some more highly dispersive bodies. The author therefore considers it as extremely probable that the essential principle of the theory has some real foundation in nature. From the regularity which he finds in the deviation of observation from theory, he thinks it likely that the formula only requires to receive some further developement, or extension, in order to make it apply accurately to the higher cases, while it shall still include the simpler form which so well accords with the lower.

"A few remarks on the Helm Wind." By the Rev. William Walton, of Allenheads, near Hexham. Communicated by P. M. Roget, M.D., Sec. R.S.

On the western declivity of a range of mountains, extending from Brampton, in Cumberland, to Brough, in Westmoreland, a distance of 40 miles, a remarkably violent wind occasionally prevails, blowing with tremendous violence down the western slope of the mountain, extending two or three miles over the plain at the base, often overturning horses with carriages, and producing much damage, especially during the period when ripe corn is standing. It is accompanied by a loud noise, like the roaring of distant thunder: and is carefully avoided by travellers in that district, as being fraught with considerable danger. It is termed the *helm wind*; and its presence is indicated by a belt of clouds, denomisated the *helm bar*, which rests in front of the mountain, three or four miles west of its summit, and apparently at an equal elevation, remaining immoveable during twenty-four or even thirty-six hours, and collecting or attracting to itself all the light clouds which approach it. As long as this bar continues unbroken, the wind blows with unceasing fury, not in gusts, like other storms, but with continued pressure. This wind extends only as far as the spot where the bar is vertical, or immediately over head; while at the distance of a mile farther west, as well as to the east of the summit of the mountain, it is not unfrequently almost a perfect calm. The author details the particulars